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DEVELOPMENT AND INTERNATIONAL ECONOMIC COOPERATION: DESERTIFICATION AND DROUGHT

Combating aridity, soil erosion, salinity, waterlogging, desertification and the effects of drought in South Asia

Report of the Secretary-General

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INTRODUCTION

Origin and objectives

1. The present report has been prepared in response to Economic and Social Council resolution 1991/97, in which the Secretary-General was requested to undertake a study to assess the extent of the problem of land degradation and its effects on the peoples of the region and to provide a framework for national and international cooperative efforts to tackle this problem in its physical and human dimensions. The work was carried out by means of a project undertaken jointly by the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP).

2. The immediate objective of the project was to undertake a comprehensive study on land degradation in South Asia and its effects upon the people. Its specific objectives indicate the matters covered in this report:*

(a) Status of land degradation: types of degradation, their nature, severity and extent;

(b) Causes and consequences of land degradation;

(c) Institutions to combat land degradation;

(d) Proposals for strengthening efforts to combat land degradation.

The South Asia region

3. The South Asia region, as covered in this report, comprises eight countries. For purposes of regional comparison they are grouped into two zones, with India divided into a dry western region and a humid region (see annex II, map 1).

Dry zone	Humid zone
Afghanistan	Bangladesh
India (dry region)	Bhutan
Islamic Republic of Iran	India (humid region)
Pakistan	Nepal
	Sri Lanka

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* A lengthier and more comprehensive report on the project, including more detailed estimates and methods of calculation, is being prepared by FAO.

4. The region has a land area of 641 million hectares (M ha) and a population (1990) of 1,200 million. The agricultural population is 768 million, 61 per cent of the total. The area of cropland is 227 M ha, of pasture 94 M ha, and thus of cropland and pasture together, termed agricultural land, 321 M ha. These statistics indicate two basic characteristics of the region, which are fundamental to the problems being considered:

(a) High density of population in relation to land resources: over 22 per cent of the world's agricultural population live on just under 5 per cent of its land area;

(b) High density of agriculture in relation to land resources: almost all land capable of sustainable agricultural use is already being farmed.

I. TYPES OF LAND DEGRADATION AND SOURCES OF INFORMATION

Definitions

5. The term land refers not just to soil but to all natural resources which contribute to agricultural production. Land degradation is the temporary or permanent lowering of the productive capacity of land. Three degrees of severity of degradation are recognized:

Light: somewhat reduced agricultural productivity;
Moderate: greatly reduced agricultural productivity;
Strong: not capable of agricultural production and unreclaimable at farm level.

6. Desertification is defined by UNEP as land degradation in arid, semi-arid and dry subhumid areas resulting from adverse human impact. In this report, therefore, it is equivalent to land degradation in the dry zone.

Types of land degradation

7. The following types of land degradation are assessed in this report:

(a) Water erosion;

(b) Wind erosion;

(c) Soil fertility decline;

(d) Waterlogging;

(e) Salinization;

(f) Lowering of the water table.

Three other types are considered in more generalized terms:

(g) Deforestation (covered by reference to FAO data);

(h) Forest degradation;

(i) Rangeland degradation.

8. Soil pollution, urban encroachment onto agricultural land and the potential effects of global climatic change, while well recognized as actual or potential problems, have not been assessed in this study.

Reversible degradation and land reclamation

9. The effects of water and wind erosion are largely irreversible. Although plant nutrients and soil organic matter may be restored, to replace the actual loss of soil material would require taking the soil out of use for many thousands of years, an impractical course of action.

10. In some cases, however, land degradation is reversible: soils with reduced organic matter can be restored by additions of plant residues; degraded pastures may recover under improved range management; and salinized soils can be restored to productive use through salinity control and reclamation projects, although at a high cost. But the cost of reclamation or restoration to productive use of degraded soils is normally much higher than the cost of preventing degradation before it has occurred.

Sources of information

11. The major source of data employed for this report is the Global assessment of soil degradation (GLASOD). Other sources are material assembled by the Asian Problem Soils Network and estimates by individual countries. GLASOD estimates provided the primary sources, modified where the balance of evidence suggested a need to do so. For deforestation, data are taken from the FAO Forest resources assessment 1990 project. However, available data on the extent and severity of degradation are highly variable. Reasons are first, a failure to define in sufficiently precise terms what is meant by the various degrees of severity of degradation; and second, the absence of reliable surveys over large areas.

II. STATUS OF LAND DEGRADATION

12. Best estimates have been made of the types, severity and extent of land degradation. Detailed results are given in tables 4 and 5 (see annex I) and maps 2-5 (see annex II). Summary data combining the degrees of severity and totals for the dry zone, the humid zone and the South Asian region as a whole, are shown in table 1 (see annex I).

13. Water erosion is the most widespread form of degradation in the region, affecting some 25 per cent of agricultural land. It is found widely in both the dry and humid zones. In many areas of sloping land, for example in Nepal, it has reached severe proportions, causing or threatening the permanent loss of the productive capacity of land.

14. Wind erosion is estimated to affect close to 40 per cent of agricultural land in the dry zone, although quantitative evidence for the definition of its degrees of severity is lacking.

15. Soil fertility decline, formerly not as widely recognized as other types of degradation, is a substantial and widespread problem in the region. It occurs through a combination of the lowering of soil organic matter and loss of plant nutrients. Evidence for fertility decline includes data on:

(a) Soil organic matter depletion;

(b) Negative soil nutrient balance;

(c) Imbalance in fertilizer application;

(d) Secondary and micronutrient deficiencies;

(e) Failure of increases in fertilizer use to be matched by increases in crop yield;

(f) Declining responses to fertilizers.

16. Waterlogging affects some irrigated lands in the alluvial plains and interior basins. While less extensive than other types of degradation on a regional scale, it is severe in some areas.

17. Salinization (including sodication) is a severe problem for irrigated lands in the dry zone. it is found both in light to moderate degrees, reducing crop yield, and in the severe degree, causing complete abandonment of formerly productive irrigated land. Salinization through intrusion of salt water is also found in coastal areas.

18. Lowering of the water table has occurred in certain irrigated areas where the groundwater remains non-saline. Although waterlogging, salinization and lowering of the water table are of smaller extent than other types of degradation, their consequences are disproportionately greater, since they mainly affect irrigated lands which are potentially the most productive.

19. A summary of the severity of land degradation with respect to the countries of the region, including the six types mentioned above, together with deforestation and rangeland degradation, is provided in table 2 (see annex I; for further details, see also tables 4 and 5 in annex I and maps 2-5 in annex II).

20. The countries in the dry zone - Afghanistan, Islamic Republic of Iran, Pakistan and the western part of India - are severely affected by water and wind erosion, soil fertility decline, deforestation and rangeland degradation. Their alluvial plain and basin areas are affected by waterlogging, salinization and lowering of the water table.

21. Four of the five countries in the humid zone - Bangladesh, Nepal, Sri Lanka and the greater part of India - are severely affected by water erosion on their rainfed lands, soil fertility decline and deforestation. in parts of the hill and mountain areas of Nepal, deforestation and water erosion have reached an extreme degree. The fifth country, Bhutan, because of its lower population density, has not yet suffered severe land degradation but deforestation, often the first step leading towards degradation, is taking place.

22. Soil fertility decline has not previously received sufficient attention. On a national scale, increases in crop yields are falling behind rates of increase in fertilizer use. Surveys have shown that soil organic matter levels are falling. Micronutrient deficiencies are being widely reported where farmers have attempted to sustain yields by application of major nutrients only. In long-term experiments, yield responses are declining except where fertilizer is applied in conjunction with organic manure. This form of degradation is found in both the humid and dry zones. While its widespread occurrence is not in doubt, quantitative estimates of its extent and severity will require further surveys and monitoring of soil changes.

III. CAUSES OF DEGRADATION

Natural hazards, direct causes and underlying causes

23. Land degradation results from natural degradation hazards, direct causes and underlying causes.

24. Natural degradation hazards are conditions of the natural environment which lead to high susceptibility to degradation, such as steep slopes, rains of high intensity, strong leaching in humid regions and drought in dry regions.

25. Direct causes of degradation are unsuitable land use and inappropriate land management practices. These vary with the type of degradation and include:

(a) Deforestation of fragile land unsuitable for sustained agricultural use;

(b) Overcutting of vegetation (very widespread);

(c) Shifting cultivation without adequate fallow periods;

(d) Overgrazing;

(e) Non-adoption of soil conservation management practices;

(f) Extension of cultivation onto lands of low potential or high natural hazards;

(g) Improper crop rotations;

(h) Plant nutrient deficits in soils, with negative nutrient budgets over many years;

(i) Unbalanced fertilizer use;

(j) Problems arising from the planning, construction and management of irrigation systems;

(k) Overpumping of groundwater in excess of capacity for recharge.

26. Underlying causes of degradation are the basic reasons which give rise to the direct causes. These are:

(a) Land shortage;

(b) Problems of land tenure; short-term or insecure tenancy, open-access resources;

(c) Economic pressures;

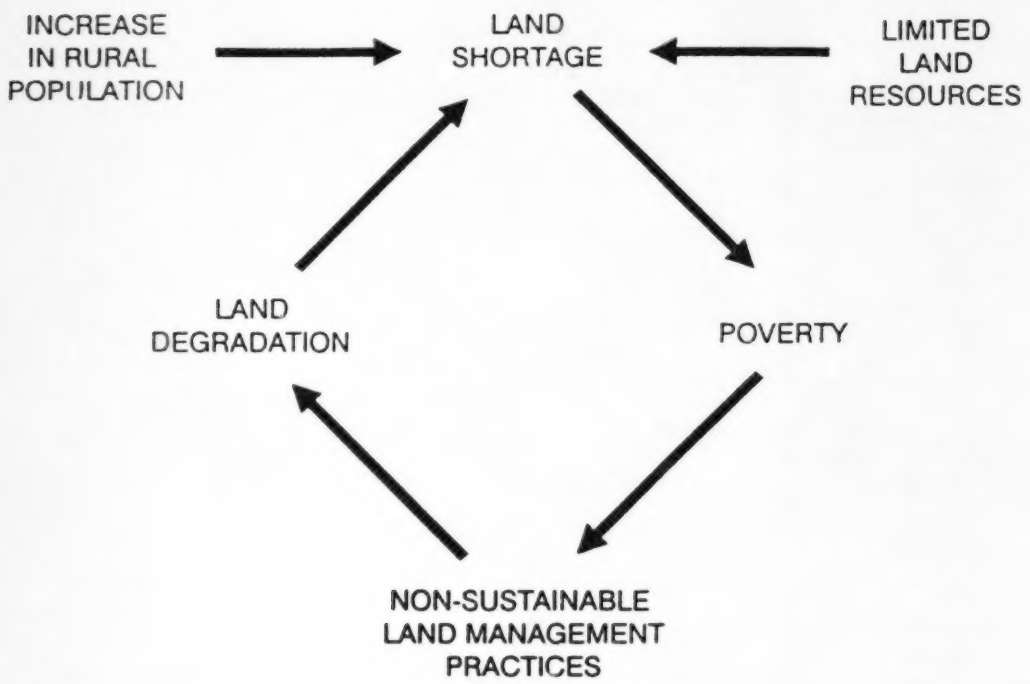
(d) Poverty;

(e) Population increase.

Causal nexus between land, population, poverty and degradation

27. The direct and indirect causes of land degradation are linked by a causal nexus (see the figure). The two external, or driving, forces are limited land resources and increase in rural population. These combine to produce land shortage, resulting in small farms, low production per person and increasing landlessness. A consequence of land shortage is poverty. Land shortage and poverty, taken together, lead to non-sustainable land management practices, the direct causes of land degradation. This has the effect of increasing land shortage, a vicious circle of cause and effect. It is population growth working in conjunction with other factors that is bringing about widespread environmental deterioration (see FAO/RAPA, 1990). Environmental degradation perpetuates poverty, as the poorest attempt to survive on a diminishing resource base (see FAO, 1991).

Causal nexus between land, population, poverty and degradation



28. There are two ways to intervene in this nexus: improved technology and reduction of population increase. Increased efforts should certainly be made in research into improved technologies, especially their more widespread implementation. However, it must be emphasized that all efforts at improved technology will be nullified and in places reversed unless they are accompanied by a reduction in the rate of growth of population.

29. For this to occur, new attitudes are required. There is growing recognition of the need to link population policy with development. Population issues currently encompass areas of concern such as poverty alleviation, environmental degradation ... which are much broader than population size and growth alone (see ESCAP, 1991). Few institutions have developed a response strategy to the implications of population pressure on natural resource management (see Asian Development Bank, 1991). The close link between poverty and environmental problems makes a compelling case of increasing assistance to reduce poverty and slow population growth (see World Bank, 1992). A much greater integration between population policy, agriculture and land resource management is needed.

IV. ECONOMIC AND SOCIAL CONSEQUENCES OF DEGRADATION

The economic cost of degradation

30. An attempt has been made to estimate the economic cost of land degradation. Many of the critical assumptions are based on tentative data, particularly the relative production loss resulting from different degrees of degradation. The results are therefore provisional, and refer to orders of magnitude of the macroeconomic effects.

31. The estimates are based primarily on the measurement of two variables: production loss and replacement cost. Production loss is the reduced productivity of the soil as a consequence of degradation, expressed as a percentage of production from the undegraded soil. For erosion and soil fertility decline, the assumptions are a 5-10 per cent production loss for a light degree of degradation, 20 per cent for moderate and 75 per cent for strong degradation; for salinity, the respective losses assumed, based on experimental data, are 15, 65 and 100 per cent respectively. Replacement cost is the cost of additional inputs (primarily fertilizer) used by farmers in order to maintain production levels on degraded soils. Price assumptions are US$ 200 per tonne for cereals and US$ 300 per tonne of fertilizer nutrients.

32. Summing the estimates for the direct on-site costs of land degradation shown in table 3 (see annex I) gives a total of US$ 9.8-11.0 billion per year. Thus, in round figures, the cumulative effect of human-induced land degradation is estimated to cost countries of the region a sum on the order of US$ 10 billion per year. The on-site cost is equivalent to 2 per cent of the gross domestic product of the region, or 7 per cent of its agricultural gross domestic product. The inclusion of off-site effects of water erosion would substantially increase this value.

Discussion

33. A contrary view exists, which states that estimates of the extent of land degradation, or of its effects on production, may be considerably exaggerated; unless and until there is a better foundation of evidence, the problem does not meet the criteria for development investment. This view serves one important purpose: it emphasizes that there are large uncertainties in estimates of the extent of degradation and its effects.

34. However, although some of the estimates are indeed based on questionable foundations, reports from all countries of the region affirm the certain existence of two kinds of degradation:

(a) Severe degradation over substantial identifiable areas (for example, gullying, total removal of topsoil by sheet erosion and complete salinization);

(b) Light to moderate degradation over extensive areas (for example, soil fertility decline on arable land and degradation of vegetation on rangelands).

35. It is therefore concluded that, although more precise data should be obtained, the evidence available is sufficient to call for immediate action in order to prevent further land degradation and reverse the effects of past degradation where possible.

Effects on the people

36. The effects of land degradation may be grouped as effects on production and consequences for the people. The effects on production and production factors are:

(a) Abandonment of land, where degradation has reached a severe degree;

(b) Reduced drop yields;

(c) Increased inputs and greater costs where farmers, out of necessity, attempt to combat reduction in yields with increased inputs, primarily of fertilizers;

(d) Reduced responses to inputs;

(e) Reduced productivity of irrigated land, thereby leading to less efficient use of the high inputs which have gone into development of irrigation;

(f) Lower flexibility of land management;

(g) Greater risk;

(h) Loss of water for irrigation;

(i) Diversion of labour, technical and financial resources to reclamation.

37. The consequences for the people are:

(a) Increased landlessness;

(b) Reduced and less reliable food supplies;

(c) Increased labour requirements;

(d) Lower incomes.

38. Land degradation has its most serious effects on the poor. Poor farmers, primarily those with small landholdings, have neither the resources to combat land degradation nor the options to meet short-term disasters, such as flood, drought or attack by pests. It is the poor who, by force of circumstance, suffer most from the nexus of land, population, poverty and degradation.

V. INSTITUTIONS AND PROGRAMMES TO COMBAT DEGRADATION

Institutional structures

39. Institutional structures to combat land degradation may be grouped into institutions responsible for strategy and policy, research and implementation. Bangladesh, India, and Pakistan possess large and complex institutional structures for these purposes. Other countries in the region have structures that are smaller but still (with the exception of Bhutan) moderately complex. The operation of institutions in Afghanistan is seriously hindered by current political conditions.

40. While most institutional questions are specific to countries, two features are commonly found:

(a) There is a tendency towards unduly complex structures, with overlapping responsibilities;

(b) Research and planning are often more advanced than implementation in the field.

41. The subject of land resources should become recognized as a major division of environmental affairs. Land resources cover the sustainable use of the resources of climate, water, soils, landforms and vegetation, combining productive use with conservation. Countries should seek to clarify institutional responsibilities in the area of land resources.

Regional collaborative programmes

42. The fight against land degradation has received support from the following regional collaborative programmes:

(a) Asian network on problem soils;

(b) Desertification Control Research and Training Network for Asia and the Pacific (DESCONAP);

(c) Fertilizer and development network for Asia and the Pacific (FADINAP);

(d) Forestry research support programme for Asia and the Pacific (FORSPA);

(e) Asian bio- and organic fertilizer network. These networks continue to play an important role in the exchange of scientific information and formulation of policy and programmes.

Environmental legislation

43. It is recognized that improvements in environmental legislation have a role to play in combating land degradation. It has not been possible, however, to include a review of such legislation in this study.

VI. PROPOSALS FOR ACTION

44. If integrated action is not taken to combat both the direct and the indirect causes of land degradation:

(a) Resources will be destroyed, in some cases irreversibly;

(b) There will be further considerable economic losses at the national level;

(c) The people, particularly the poor, will suffer.

A prerequisite for effective action is the recognition, by national Governments, of the severity of land degradation and its effects on the people. It is not sufficient to merely discuss the environment and write reports. There must be allocation of staff, budget and resources.

45. Seven proposals follow for action to strengthen efforts to combat land degradation. They are confined to the main lines of approach and action. Many of the proposed actions will initially require discussion on a regional and in some cases global basis, in order to secure uniformity of methods. They will subsequently require modifications in detail to meet the circumstances of different countries.

1. Practical definitions of degrees of severity of land degradation

46. These must be in terms that allow practical means of observation, monitoring and mapping. This action would be best taken at the international level, in order to achieve comparability of information world wide.

2. Establishment of a regional programme and guidelines for the assessment of land degradation

47. This should include:

(a) Survey of the present state of degradation;

(b) Monitoring of changes in soils, water and vegetation and establishment of benchmarks of progress/deterioration.

3. Study of the economic and social effects on the people

48. Such work should be conducted in parallel with physical surveys, with cooperation in the field between land resource scientists and social scientists.

4. Translation of regional guidelines into national programmes

49. Matters that should be covered are:

(a) Clarify institutional responsibilities. It may be necessary to establish high-level advisory committees on land degradation control policy;

(b) Identify nodal institutions for land degradation control;

(c) Identify priorities with respect to types of degradation and critical areas;

(d) Plan and carry out national programmes.

5. Research into measures to combat degradation

50. Practical field implementation should be continuously supported by research. Matters which require particular attention include:

(a) Practical methods of improving and maintaining soil organic matter status;

(b) Ways of securing the participation of the people in implementing improved land management (for example, soil conservation measures which provide intrinsic incentives for land users);

(c) Research into the underlying causes of degradation, as well as the integration of land resource management with wider aspects of population policy.

6. Implementation of measures to combat the direct causes of degradation

51. Much activity of this nature is already being undertaken but the scale of activity should be expanded. Increased funding will be required. Measures of this type include:

(a) Watershed management and soil conservation projects and extension work;

(b) Methods for improving soil organic matter status;

(c) Application of integrated plant nutrition systems;

(d) Salinity control and reclamation projects;

(e) Reafforestation;

(f) Further development of agro-forestry, including applications for soil conservation;

(g) Control of desertification; including sand-dune fixation and improved range-land management.

7. Action directed towards removing the underlying causes of degradation, including integration of land management measures with population policy

52. Attempts to combat land degradation directly, by conservation measures or land reclamation, can have only short-term effects unless they are accompanied by efforts to tackle the underlying causes. These lie in the causal nexus between population increase, limited land resources, land shortage, poverty, non-sustainable land management practices and land degradation. In the prevailing situation, in which there is no spare land available, population increases of 2-3 per cent per year will largely or entirely counteract the effects of measures for improvement. Population is a sensitive issue, but all Governments of the region are aware of the problems caused by continued increase at present rates. In the context of land degradation, a much greater integration between population policy, agriculture and land resource management is needed. For this to occur, new attitudes will be required: due recognition of land holders' rights to the resources; external (global) trade and subsidy policies on commodities and inputs (with reference to the Uruguay Round); and the recognition and standardization of a price valuation for environmental assets (land, water etc.) in economic and financial feasibility calculations.

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Note: RAPA = Regional Office for Asia and the Pacific (FAO)

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Annex I

TABLES

Table 1. Percentage of agricultural land affected by degradation: summary

Type of land degradation	Dry zone	Humid zone	Region
Water erosion	32	20	25
Wind erosion	39	0	18
Soil fertility decline	5	20	13
Waterlogging	4	0	2
Salinization	19	<1	9
Lowering of the water table	13	0	6

Table 2. Severity of land degradation in countries of the region

	Afghanistan	Bangladesh	Bhutan	India		Islamic Republic of Iran	Nepal	Pakistan	Sri Lanka
				Dry region	Humid region				
Water erosion	XX	X	..	XX	XX	XX	XX	XX	XX
Wind erosion	X	..	..	XX	..	XX	..	XX	..
Soil fertility decline	..	XX	..	..	XX	..	..	XX	XX
Waterlogging	..	..	..	XX	..	X	..	X	..
Salinization	X	..	..	XX	..	XX	..	XX	..
Lowering of the water table	..	..	..	X	..	XX	..	..	..
Deforestation	XX	XX	X	X	X	X	XX	XX	X
Rangeland degradation	XX	..	..	XX	..	XX	..	XX	..

X = Moderately severe.

XX = Very severe.

Table 3. Provisional estimates of the cost of land degradation to the region

(Billions of United States dollars)

Type of degradation	Cost	Notes
Water erosion	5.4	On-site effects only
Wind erosion	1.8	Assessed relative to water erosion
Fertility decline	0.6-1.2	Tentative estimate
Waterlogging	0.5	
Salinization	1.5	
Lowering of water table		Not assessed

Table 4. Best estimates of areas affected by land degradation

	Light	Moderate	Strong	Total	Total as percentage of agricultural land
	(Millions of hectares)				
Water erosion					
Afghanistan	8.6	2.6	0.0	11.2	29
Bangladesh	0.0	1.5	0.0	1.5	15
Bhutan	<0.1	0.0	<0.1	<0.1	10
India a/	2.9	17.2	12.6	32.8	18
Islamic Republic of Iran	14.5	11.9	0.0	26.4	45
Nepal	0.5	1.1	0.0	1.6	34
Pakistan	6.1	1.1	0.0	7.2	28
Sri Lanka	0.1	0.2	0.8	1.1	46
India, dry region a/	1.2	0.0	1.7	2.9	-
India, humid region a/	1.8	17.2	10.9	29.9	-
Region	32.7	35.6	13.5	81.7	25
Wind erosion					
Afghanistan	1.9	0.0	0.2	2.1	5
Bangladesh	0.0	0.0	0.0	0.0	0
Bhutan	0.0	0.0	0.0	0.0	0
India a/	0.0	1.8	9.0	10.8	6
Islamic Republic of Iran	6.6	25.7	3.1	35.4	60
Nepal	0.0	0.0	0.0	0.0	0
Pakistan	4.0	6.7	0.0	10.7	42
Sri Lanka	0.0	0.0	0.0	0.0	0
India, dry region a/	0.0	1.8	9.0	10.8	-
India, humid region a/	0.0	0.0	0.0	0.0	-
Dry zone	12.4	34.2	12.3	59.0	39
Humid zone	0.0	0.0	0.0	0.0	0
Region	12.4	34.2	12.3	59.0	18

	Light	Moderate	Strong	Total	Total as percentage of agricultural land
	(Millions of hectares)				
Soil fertility decline					
Afghanistan	0.0	0.0	0.0	0.0	0
Bangladesh	6.4	0.0	0.0	6.4	65
Bhutan	0.0	0.0	0.0	0.0	0
India a/	26.2	0.0	3.2	29.4	16
Islamic Republic of Iran	0.0	0.0	0.0	0.0	0
Nepal	0.0	0.0	0.0	0.0	0
Pakistan	5.2	0.0	0.0	5.2	20
Sri Lanka	0.7	0.7	0.0	1.4	61
India, dry region a/	2.2	0.0	0.0	2.2	..
India, humid region a/	24.0	0.0	3.2	27.2	..
Dry zone	7.4	0.0	0.0	7.4	5
Humid zone	31.1	0.7	3.2	35.0	20
Region	38.5	0.7	3.2	42.4	13
Waterlogging					
Afghanistan	0.0	0.0	0.0	0.0	0
Bangladesh	0.0	0.0	0.0	0.0	0
Bhutan	0.0	0.0	0.0	0.0	0
India a/	0.0	3.1	0.0	3.1	2
Islamic Republic of Iran	0.5	0.0	0.0	0.5	1
Nepal	0.0	0.0	0.0	0.0	0
Pakistan	0.8	0.4	0.8	2.0	8
Sri Lanka	0.0	0.0	0.0	0.0	0
India, dry region a/	0.0	3.1	0.0	3.1	..
India, humid region a/	0.0	0.0	0.0	0.0	..
Dry zone	1.4	3.5	0.8	5.7	4
Humid zone	0.0	0.0	0.0	0.0	0
Region	1.4	3.5	0.8	5.7	2

	Light	Moderate	Strong	Total	Total as percentage of agricultural land
	(Millions of hectares)				
Salinization					
Afghanistan	1.3	0.0	0.0	1.3	3
Bangladesh	0.0	0.0	0.0	0.0	0
Bhutan	0.0	0.0	0.0	0.0	0
India a/	0.0	3.5	3.5	7.0	4
Islamic Republic of Iran	5.0	7.0	4.0	16.0	27
Nepal	0.0	0.0	0.0	0.0	0
Pakistan	1.9	1.0	1.3	4.2	16
Sri Lanka	<0.1	0.0	0.0	<0.1	2
India, dry region a/	0.0	3.5	3.5	7.0	..
India, humid region a/	0.0	0.0	0.3	0.3	..
Dry zone	8.2	11.5	8.5	28.1	19
Humid zone	<0.1	<0.1	0.3	0.4	<1
Region	8.2	11.5	8.8	28.5	9
Lowering of the water table					
Afghanistan	0.0	0.0	0.0	0.0	0
Bangladesh	0.0	0.0	0.0	0.0	0
Bhutan	0.0	0.0	0.0	0.0	0
India a/	0.1	0.1	0.0	0.2	<1
Islamic Republic of Iran	12.1	7.4	0.0	19.5	33
Nepal	0.0	0.0	0.0	0.0	0
Pakistan	0.0	0.1	0.0	0.1	<1
Sri Lanka	0.0	0.0	0.0	0.0	0
India, dry region a/	0.1	0.1	0.0	0.2	..
India, humid region a/	0.0	0.0	0.0	0.0	..
Dry zone	12.2	7.7	0.0	19.8	13
Humid zone	0.0	0.0	0.0	0.0	0
Region	12.2	7.7	0.0	19.8	6

a/ Values of water erosion for India may be substantially higher.

Table 5. Estimates of forest area and rate of deforestation

Country a/	Total land area	Forest area 1980	Forest area 1990	Forest cover 1990	Annual deforestation	Rate of change
	(millions of hectares)			(percentage)	(thousands of hectares)	(percentage)
Bangladesh	13.0	1.1	0.8	5.9	38	-3.28
Bhutan	4.7	3.0	2.8	59.8	16	-0.55
India	297.3	55.1	51.7	17.4	339	-0.62
Nepal	13.7	5.6	5.0	36.7	54	-0.98
Pakistan	77.1	2.6	1.9	2.4	77	-2.92
Sri Lanka	6.5	2.0	1.7	27.0	27	-1.34
Total (6 countries)	412.3	69.4	63.9	15.5	551	-0.79

Source: Food and Agriculture Organization of the United Nations forest resources assessment 1990 project.

a/ Data for Afghanistan and the Islamic Republic of Iran are not currently available.

Annex II

MAPS

Map 1. The South Asia region, by country and humidity zone

Source: United Nations Environment Programme/International Soil Reference and Information Centre.

Note: 90-day LGP = 90-day length of growing period.

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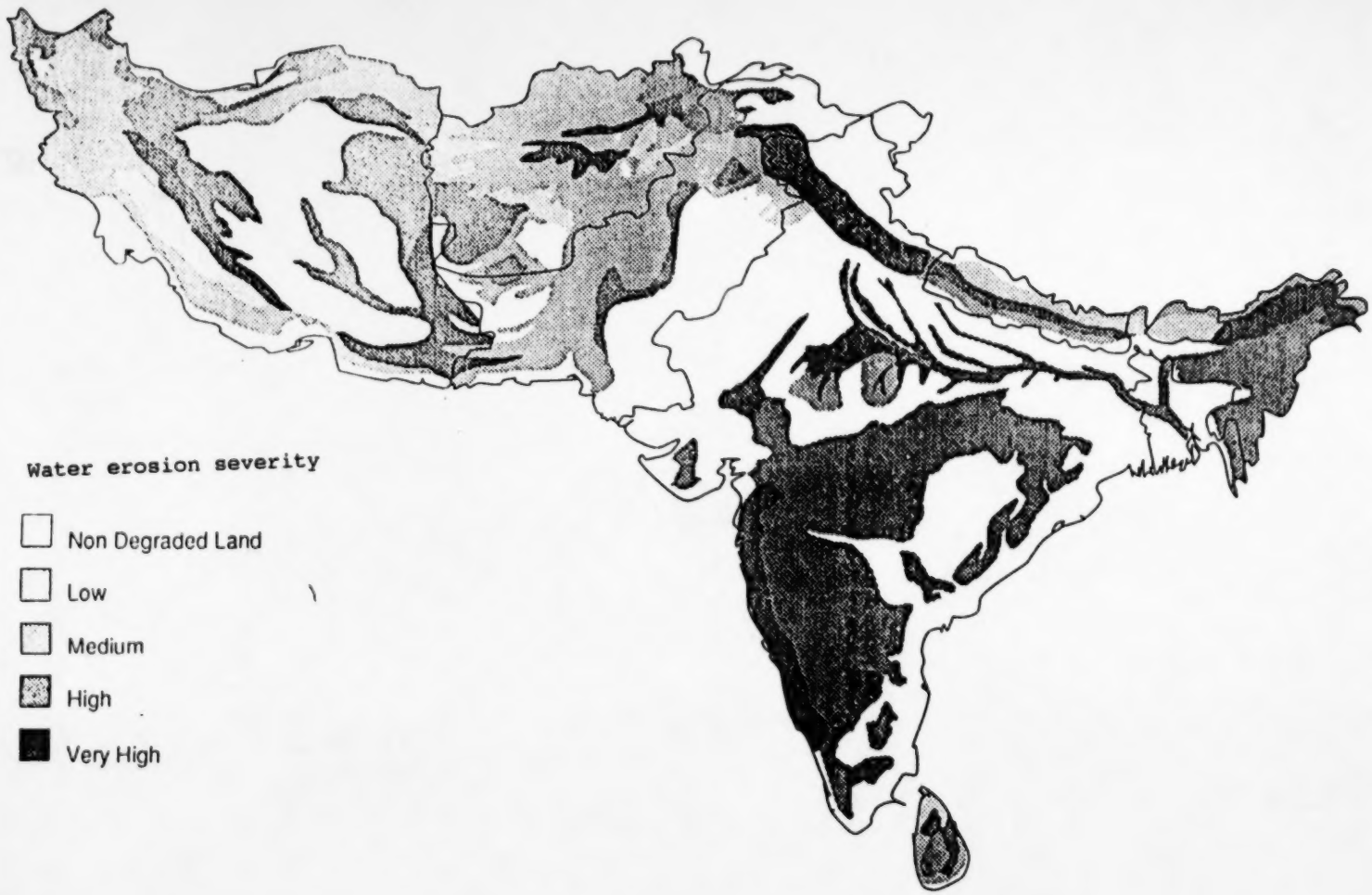
Map 2. Severity of water erosion (GLASOD estimate)



Source: United Nations Environment Programme/International Soil Reference and Information Centre.

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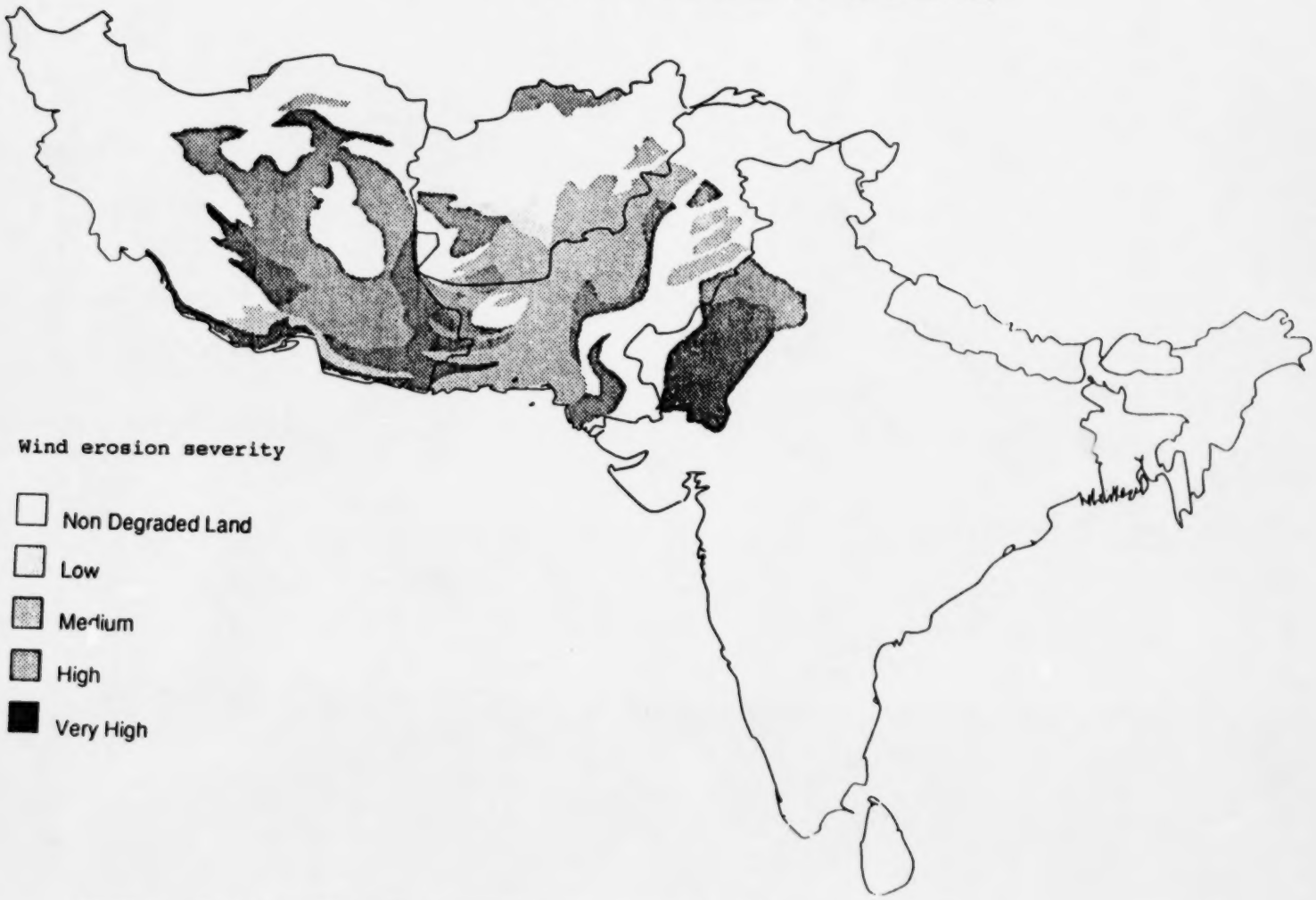
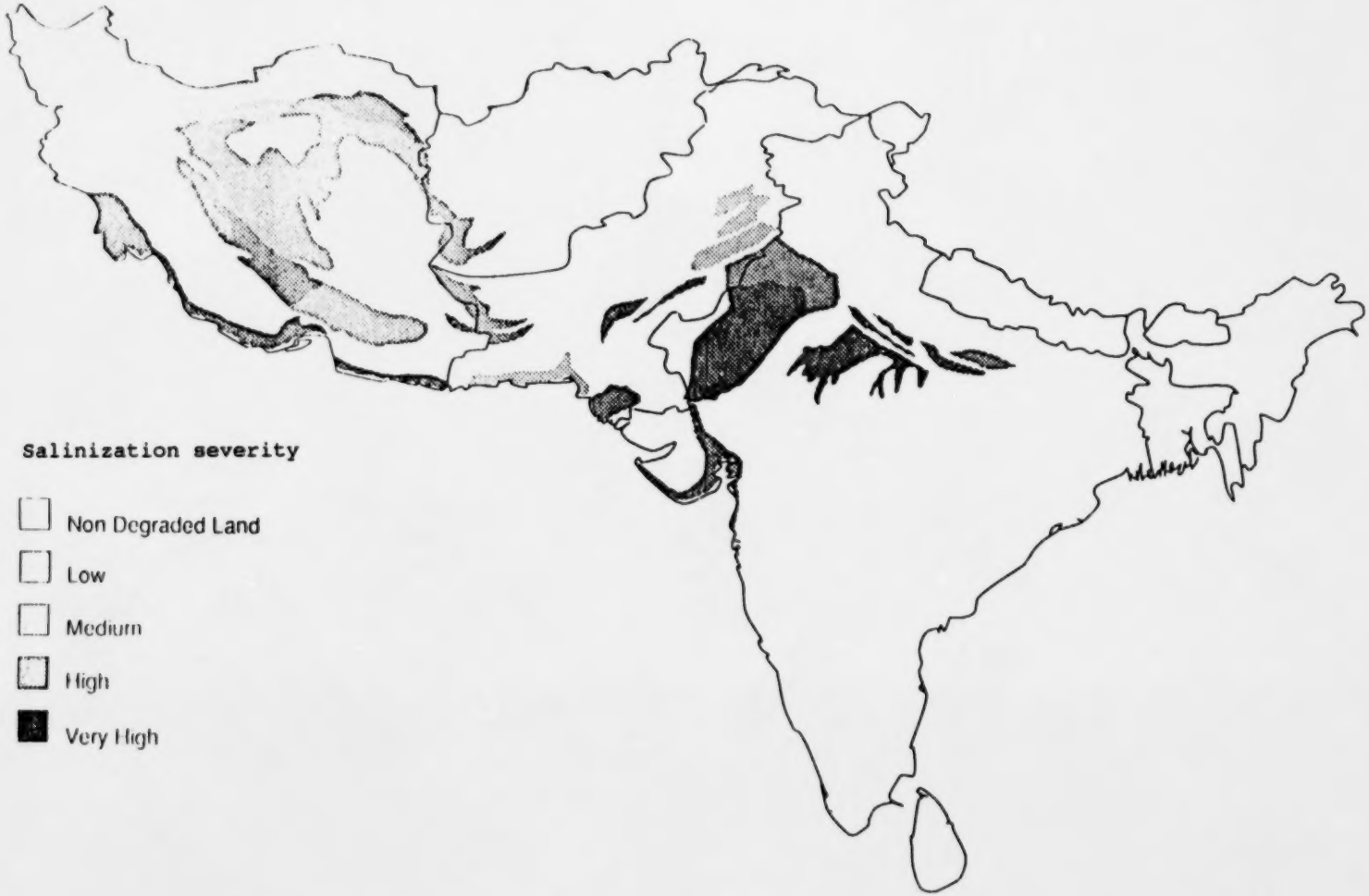
Map 3. Severity of wind erosion (GLASOD estimate)



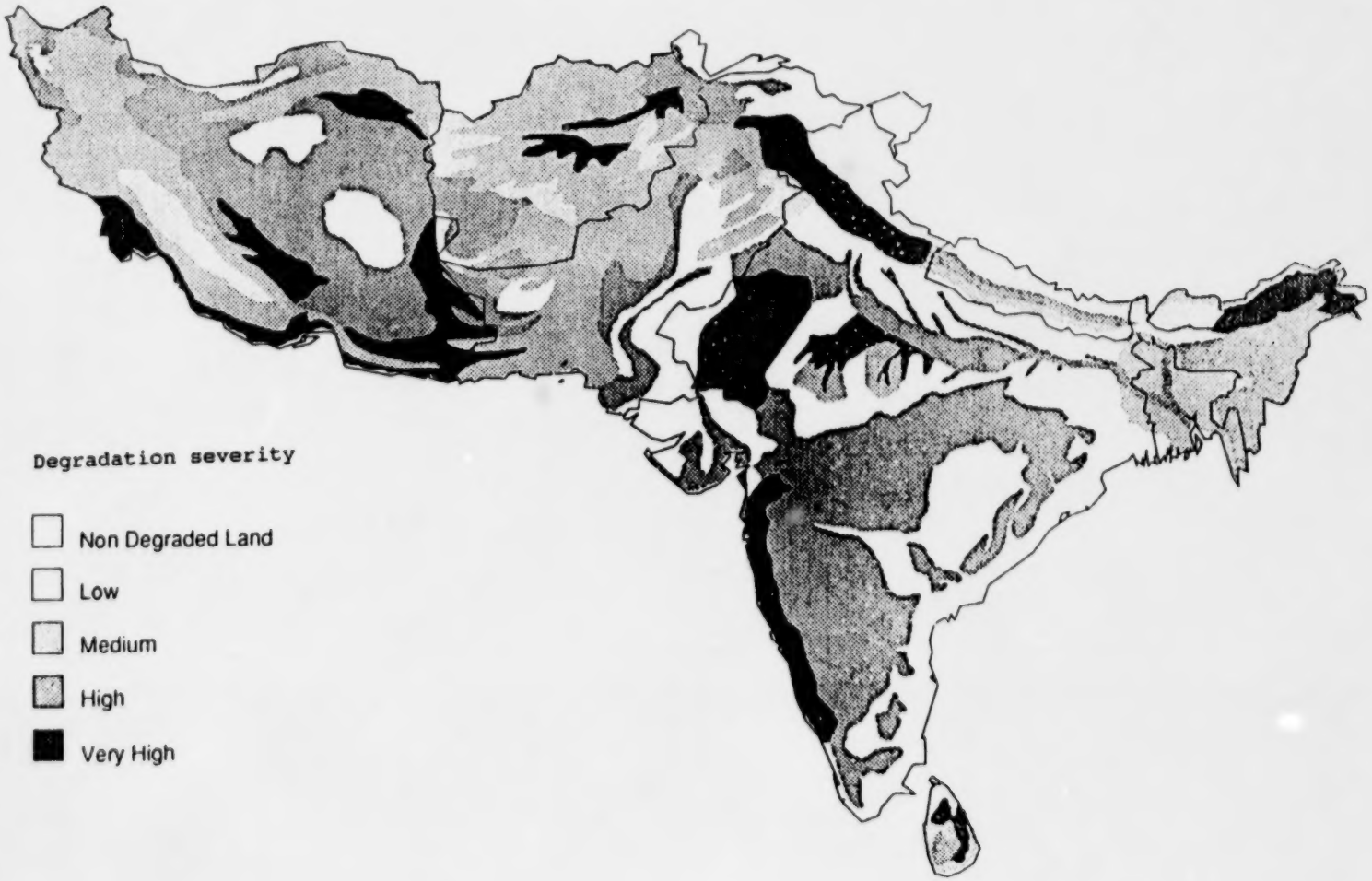
Source: United Nations Environment Programme/International Soil Reference and Information Centre.

Map 4. Severity of salinization (GLASOD estimate)



Source: United Nations Environment Programme/International Soil Reference and Information Centre.

Map 5. Severity of land degradation



Source: United Nations Environment Programme/International Soil Reference and Information Centre.